The Effects of Personality Type in User-Centered Appraisal Systems

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Abstract. The basic objective of this paper is to make an extensive reference of a combination of concepts and techniques coming from different research areas, Psychology and Web personalization technologies, both of which focus upon the user. It has been attempted to approach the theoretical considerations and technological parameters that can provide the most comprehensive user profile, under a common filtering element, supporting the provision of the most apt and optimized user-centered web-based result. It further underpins the significance of the comprehensive user profile that incorporates not only the traditional user characteristics, but other intrinsic values of the user such as user psychological preferences (affect, personality and emotional processing parameters). Eventually, this paper introduces our first experimental results that concern the concept of personality and its effect on decision making and problem solving user profiles.

Keywords: Personality, emotion, personalization, decision-making, problem solving, learning.

1 Introduction

Since 1994, the Internet has emerged as a fundamental information and communication medium that has generated extensive enthusiasm. The Internet has been adopted by the mass market much quicker than any other technology over the past century and is currently providing an electronic connection between progressive businesses and millions of customers and potential customers whose age, education, occupation, interest, and income demographics are excellent for sales. The explosive growth in the size and use of the WWW as well as the complicated nature of most Web structures result in orientation difficulties, as users often lose sight of the goal of their inquiry, look for stimulating rather than informative material, or even use the navigational features unwisely. As the e-Services sector is rapidly evolving, the need for such Web structures that satisfy the heterogeneous needs of its users is becoming more and more evident.

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To alleviate such navigational difficulties, researchers have put huge amounts of effort to identify the peculiarities of each user group and analyze and design methodologies and systems that could deliver up-to-date adaptive and personalized information, with regards to products or services. To date, there has not been a concrete definition of personalization. The many Web solutions offering personalization features meet an abstract common goal: to provide users with what they want or need without expecting them to ask for it explicitly [1]. Further consideration and analysis of parameters and contexts such as users' cognitive and mental capabilities, socio-psychological factors, emotional states and attention grabbing strategies should be extensively investigated. All these characteristics could affect the apt collection of users' customization requirements and along with the 'traditional' user characteristics (i.e. name, age, education, experience, profession etc.) constitute a comprehensive user profile that serves as the ground element of most of these systems offering in return the best adaptive environments to their preferences and demands.

Although one-to-one Web-based content provision may be a functionality of the distant future, user segmentation is a very valuable step in the right direction. User segmentation means that the user population is subdivided, into more or less homogeneous, mutually exclusive subsets of users who share common user profile characteristics enabling the possibility of providing them with a more personalized content. The subdivisions could be based on: Demographic characteristics (i.e. age, gender, urban or rural based, region); socio-economic characteristics (i.e. income, class, sector, channel access); psychographic characteristics (i.e. life style, values, sensitivity to new trends); individual physical and psychological characteristics (i.e. disabilities, attitude, personality and emotion).

Adaptivity is a particular functionality that alleviates navigational difficulties by distinguishing between interactions of different users within the information space [2]. The user population is not homogeneous, nor should be treated as such. To be able to deliver quality knowledge, systems should be tailored to the needs of individual users providing them personalized and adapted information based on their perceptions, reactions, and demands.

2 Elements of Web-Based Appraisal Systems

For many years people have been trying to measure differences between individuals. Over the course of time, a combination of developments in statistical know-how and the evolution of thought within psychology enabled the refinement of measures, and subsequently the assessment of more specific factors in the field of individual differences like different kinds of ability, affect and personality. This knowledge has been used in many areas within psychology and at the same time the advancement of technology has enabled the development of web-based appraisal systems that measure specific factors relevant to specific situations.

Web-based information systems are increasingly being used for learning and training applications. Computers are becoming better and more sophisticated every day. They can already perceive information related to user needs, preferences and characteristics [3, 4]. One possible implementation of a Web-based system's interface that can appraise

human characteristics is through the use of a series of online tests and questionnaires that can assess the abilities and properties of the user [5]. E-assessment is the use of information technology for any assessment-related activity. Due to its obvious similarity to e-learning, the term e-assessment is becoming widely used as a generic term to describe the use of computers within the assessment process. E-assessment can be used to assess cognitive and affective abilities using e-testing software.

A web-based assessment system usually measures verbal and quantitative abilities but in order to acquire a more solid impression of the users' potential we include in addition some purely psychological constructs that help us measure terms like personality and affect. It does not measure a person's knowledge on specific fields of study and only minimal computer skills are needed. The Verbal section measures a user's ability to read and comprehend written material, to reason and evaluate arguments. Two types of multiple-choice questions are used in the verbal section, Reading Comprehension and Critical Reasoning. The Quantitative section measures a person's ability to reason quantitatively, solve quantitative problems, and interpret graphic data. Two types of questions are used in the quantitative section, Problem solving and Data sufficiency. Both types of question require basic knowledge of Arithmetic, Elementary algebra and commonly known concepts of geometry [6].

The use of psychometric data is considered a valuable tool for the evaluation of the individual. Psychometrics is an area of Psychology concerned with the systematic testing, measurement and assessment of aptitudes and personality. Psychometric assessments are used to complement less formal and more subjective methods to help teachers or managers reach more widely informed and objective judgements about people. We believe that by putting a special emphasis in the psychometric abilities of the user we will be able to examine a hidden but very important aspect of his behavior and performance.

3 Incorporating Cognitive and Affective Factors in the Personalization Process

The concepts of personality and affect underpin psychology's attempt to identify the unique character of individuals. The terms describe properties of behavior which concern the individual's typical ways of coping with life events [7]. An in-depth model that grasps the complexity of these underlying concepts is the first purpose of our research. Instead of selecting one area of implementation we are trying to combine these three levels of analyses (verbal, quantitative and psychological) and form a typology that will help us circle effectively the cognitive and affective mechanisms of the brain. In order to apply a purely psychological construct to a digital platform we adjust the various theories concerning cognition and emotion having in mind to make our model flexible and applicable to users' profiles, needs and preferences. The verbal and quantitative sections of the appraisal system are straightforward and cannot be significantly manipulated since they are easily quantifiable. In order to manipulate the parameters in the psychological section according to user characteristics, our research has to go through the stage of extracting quantified elements that represent deeper psychological and affective abilities. The latter cannot be directly used in a web environment, but a numerical

equivalent can define a user characteristic. Apart from the standard personality questionnaire we developed a theory and a corresponding battery of questionnaires for the concept of Affect. Our psychological model of Affect has two base elements: Emotional Arousal is the capacity of a human being to sense and experience specific emotional situations. An effort to construct a model that predicts the role of specific emotions is beyond the scope of our research, due to the complexity and the numerous confounding variables that would make such an attempt rather impossible. We focus on arousal as an emotional mechanism and not on a number of basic emotions because emotional arousal can provide some indirect measurement of general emotional mechanisms since it manages a number of emotional factors like anxiety, boredom effects, anger etc. Our model would be problematic without a regulatory mechanism of affect. For this reason we constructed the measure of Emotion Regulation that is comprised from terms like emotional intelligence, self-efficacy, emotional experience and emotional expression. Emotion regulation is the way in which an individual is perceiving and controlling his emotions. Individuals attempt to influence which emotions they have, when they have them and how they experience and express them [8]. By combining the affective state of the individual with his regulatory mechanism we can reach into a conclusion of how affect influences his performance and the outcome of his behaviour.

4 The Concept of Personality

The personality theory that we follow is based on Eysenck's PEN model. The PEN model is comprised of three personality dimensions based on psychophysiology: Psychoticism, Extraversion and Neuroticism. These three dimensions are related to basic emotions and are considered to be superfactors that include lower-order factors such as sociability and positive affect. These lower order factors in turn include habits and behavioral patterns such as the components of sociability and impulsivity. Psychoticism is associated with the liability to have a psychotic episode or break with reality and also with aggression. Extraversion is related to social interest and positive affect, while Neuroticism is related with negative affect, stressors and pressure of many kinds. In this paper we present our first experimental procedure which investigates the connection between personality factors and decision making and problem solving styles. We consider important to clarify these basic and important concepts before examining deeper affective constructs. Personality is the doorway to emotional behavior and decision making and problem solving is an indirect way to make inferences to a person's learning pattern since learning includes continuous decision making and problem resolution [9].

5 Experimental Evaluation

5.1 Sampling and Procedure

The study was carried out within one week and the participants were all Greek citizens that live in Greece. All participants were of relatively young age studying or working at the time of administration. They could either participate in the experimental sessions that were held in the New Technologies laboratory in

University of Athens or fill in the questionnaires that could also be found online in the web page designed specifically for that purpose. They were all given a battery of questionnaires. A total of 247 questionnaires were completed and returned. 55 of them were half completed or had double answers and were omitted from the sample. Our final sample included 192 participants giving a completion rate of almost 80%.

Participants varied from the age of 18 to the age of 40, with a mean age of 27 and a standard deviation of 5. 73 respondents were male and 119 were female. Among other demographic characteristics that were examined were the profession and the computer experience level of each participant.

5.2 Questionnaires

The study used questionnaires to collect quantitative data. It included five measures, one each for personality, emotional arousal, emotion regulation, decision making styles and problem solving styles. Our first treatment involved the close examination of the personality questionnaire and its correlation with decision making and problem solving styles. To evaluate personality we used Eysenck's Personality Questionnaire, the revised short version (EPQR-S), a short version of EPQR with 48 items and three scales (Extraversion, Neuroticism, Psychoticism), suitable for web environments because it can be administered fast and it is accurate enough in predicting user behaviour [10]. For Decision Making we used the General Decision-Making Style Inventory (DMSI) by Scott and Bruce [11] which includes 25 items and 5 scales (Spontaneous, Dependent, Rational, Avoidant, Intuitive) and for Problem Solving the Problem Solving Styles Questionnaire (PSSQ) by Parker with 20 items and four scales (Sensing, Intuitive, Feeling, Thinking).

5.3 Design

Internal consistency was assessed by computing Cronbach alphas for the three measures. Although there are no standard guidelines available on appropriate magnitude for the coefficient, in practice, an alpha greater than 0.60 is considered reasonable in psychological research [12]. After the inspection of the alpha coefficients, we performed descriptive statistics for the study sample as a whole and for the particular scales under investigation to examine the sample's suitability. Since our sample was normally distributed with variance of suitable proportions we continued our statistical analysis with the use of the statistical package SPSS. The statistical analysis used to perform this study was mainly one-way Analysis of Variance (ANOVA). Our research hypothesis stated that personality factors will have an effect on the participant's style of action. More specifically, participants that score high in Neuroticism, Extraversion and Psychoticism scales will have a tendency towards more emotional and less rational styles.

6 Results

For the purposes of the experiment, Analyses of Variance (ANOVA) were performed in order to indicate the relationships between the variables of the study. Table 1 presents the main findings between the scale of neuroticism and the scales of the DMSI and PSSQ. The analyses indicated that neuroticism correlated highly with the

Table 1. Statistical Significance between the Neuroticism scale and Decision-Making and Problem-Solving Styles

Constuct	F	Sig.
DM-Spontaneous	4.422	.037*
DM-Rational	4.888	.028*
DM-Avoidant	5.319	.022*
PS-Feeling	9.579	.002**
PS-Thinking	5.005	.026*

*p<0.05
**p<0.01

spontaneous, rational and avoidant styles of the decision making questionnaire and the feeling and thinking styles of the problem solving questionnaire.

A person highly neurotic is typically anxious, tense and moody. He can get emotional easily and therefore is reasonable to react in a spontaneous and not thoughtful way in occasions or with an inhibition of action in others. His pattern of behavior is tense as his character and is subjective to strong feelings. On the other hand a stable person is more rational and more methodical in his behavior. In figure (graph) 1 we can clearly see that neurotics have a higher mean in spontaneous, avoidant and feeling scores while stable participants have higher scores in rational and thinking styles.

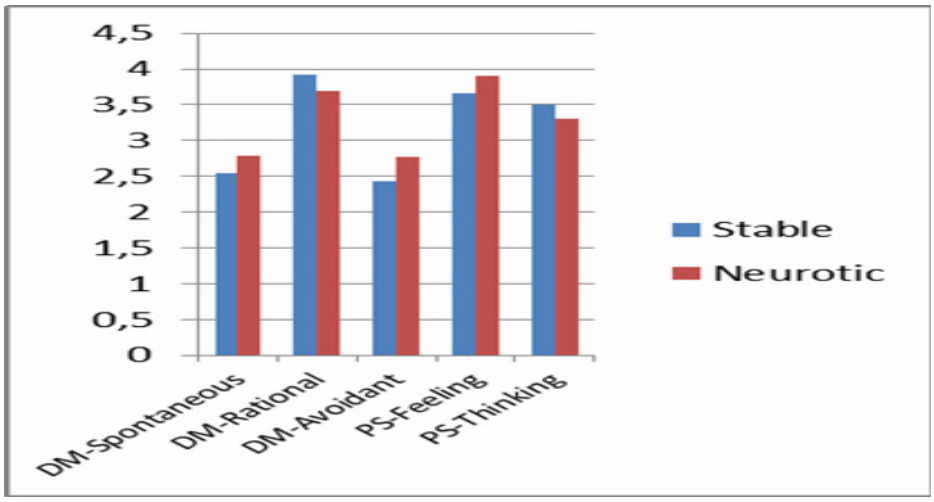

Fig. 1. Means of neurotic and stable participants in the statistically significant styles. Neurotic participants have higher means in the more "emotional" styles of spontaneous, avoidant and feeling while stable participants score higher in the "logical" ones such us rational and thinking.

The Psychoticism scale includes traits such as egocentric, dogmatic, tough-minded and aggressive. People that score highly in this scale tend to react on their own. In table 2 can be seen the significant differences between people with high psychoticism score and people with low.

Table 2. Statistical Significance between the Psychoticism scale and Decision-Making and Problem-Solving Styles

Constuct	F	Sig.
DM-Spontaneous	4.719	.031*
PS-Intuitive	4.905	.028*

*p<0.05

The extraversion construct includes traits such as sociable, sensation-seeking, impulsive, expressive and active. On the contrary, the other side of the scale, the introvert is more reflective and more centered in the inner energy of his self. Table 3 shows once again the significant differences with styles.

Table 3. Statistical Significance between the Extraversion scale and Decision-Making and Problem-Solving Styles

Constuct	F	Sig.
DM-Intuitive	6.733	.010*
PS-Sensing	9.543	.002**
PS-Feeling	4.345	.039*

*p<0.05
**p<0.01

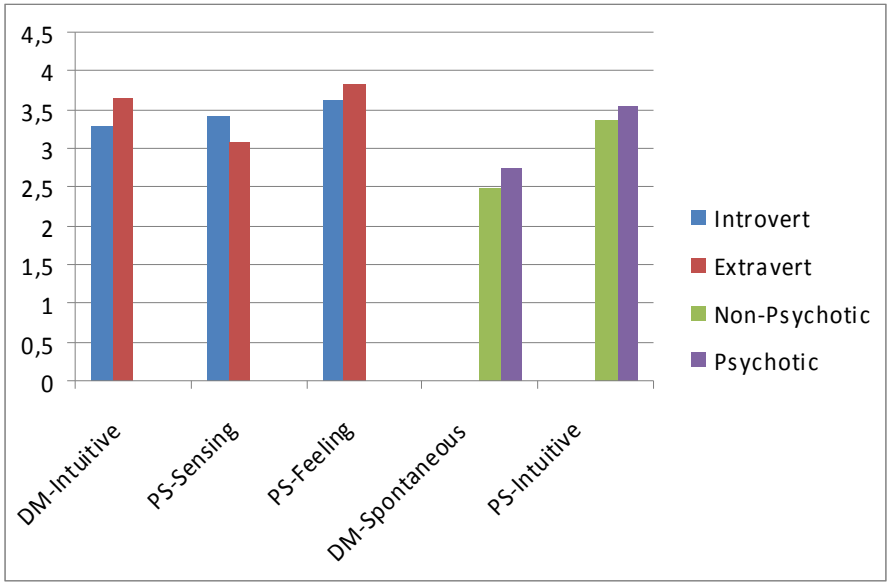

Fig. 2. Means of psychotic and extravert participants in the statistically significant styles

In figure (Graph) 2 we can see that those that score high in psychoticism are more spontaneous and intuitive probably because they are not co-operative and often react emotionally. In the same graph it is depicted that extraverts, as predicted, show higher scores in intuitive and feeling styles because they will not examine the facts closely, while introverts score higher in the sensing category as it is reasonable because they tend to put an emphasis on the detail.

7 Discussion

It may come as no surprise that personality factors are important in the decision and problem solving process. Personality traits such as Neuroticism, Psychoticism and Extraversion are comprised from characteristics that people often exhibit in their decision making. The analyses indicated that participants high in the neuroticism scale were more emotional than stable participants low on neuroticism. Stable participants across the various conditions proved to be more logical and straightforward. As it is shown, extraverts are more likely to experience emotions while individuals with high neuroticism and psychoticism tend to experience negative emotions especially anxiety.

Apart from the standard personality questionnaire we developed a theory and a corresponding battery of questionnaires for the concept of Affect [13]. The next step of our research is to combine these findings with the purely affective elements of our model. It has been argued that positive affect increases motivation, attention, pleasantness, participation and engagement, while negative affect is highly involved with boredom, fear, anger, displeasure and distraction.

By combining the personality style and the affective state of the individual with his regulatory mechanism we can reach into a conclusion of how affect influences his performance and the outcome of his behavior. At the same time our level of implementation after analysing our findings in decision making and problem solving preferences, will concentrate directly on the user learning process. We have already developed a web-based system based on learning performance evaluation for the testing of the various instruments that we have incorporated in our model [14]. The cognitive elements are more straightforward since they are easier to measure and easier to quantify and we have already reached a level in which we can make inferences about how users with different cognitive abilities and preferences can be aided or guided through a personalized web interface [15]. The final step to complete the implementation of our model is to add the affective elements and to investigate the inner and deeper relations that exist between them. Personality type is the fundamental construct since personality research is already established and developed to a great extent. Our next task is to examine our findings in combination with the constructs of task-specific anxiety and emotion regulation.

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